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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/577,104	04/25/2006	Herbert Friedrich Boerner	DE 030368	1148
24737 7590 05/22/2009 PHILIPS INTELLECTUAL PROPERTY & STANDARDS P.O. BOX 3001 BRIARCLIFF MANOR, NY 10510				
EXAMINER				
GREEN, TRACEY Y				
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2879				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/577,104

**Applicant(s)**

BOERNER ET AL.

**Examiner**

Tracie Green

**Art Unit**

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 January 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SG/US)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### Response to Amendment

1. Receipt is acknowledged of applicant's amendment filed 07/21/2008. Claims 1-2, 4-16 are pending and an action on the merits is as follows.
2. Applicant's amendments with respect to claim 1 and newly added claims 17-21 has been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 8-9 and 14-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Thompson et al. (US 2003/0068528 A1).

**Regarding claim 8**, Thompson et al. (Thompson, hereafter teaches) a light-emitting device comprising: an electroluminescent layer (ETL) for emitting light when excited; a hole transport layer (HTL) for facilitating injection of holes into the electroluminescent layer; (Paragraph 13 and 34) a hole blocking layer (exciton blocking layer, which has both exciton and hole blocking capabilities), located between the electroluminescent layer and the hole transport layer, *for preventing injection a portion of hole in the hole transport layer into the electroluminescent layer when the electroluminescent layer is excited to emit light.* (Examiner note: this portion of the claim is drawn to a method of

*operating and does not delineate any structural limitations, as such this portion of the claim will not be afforded patentable weight) wherein a first highest occupied molecular orbital (HOMO) energy level of the hole blocking layer is lower than a second HOMO energy level of the hole transport layer (Paragraph 82) (Examiner note: prior art teaches a HTL/LEL layer in which the dopant is the transport layer, prior art teaches the HOMO energy level of the HBL or exciton layer being lower than this dopant, thus satisfying this claim)*

**Regarding claim 9**, Thompson teaches wherein the first HOMO energy level of the hole blocking layer is lower than a third HOMO energy level of the electroluminescent layer (Paragraph 27, lines 1-10).

**Regarding claim 14**, Thompson teaches wherein the hole blocking layer has a thickness of less than or equal to 10 nm (Paragraph 80, lines 9-13) *(Examiner note: prior art reference teaches this layer to be between 50-1000 angstroms= 5-100nm)*

**Regarding claim 15**, *this claim is drawn to a method of operating and does not provide any particular structural limitations; therefore this claim is not considered germane to the applicant's invention as currently claimed)*

### ***Claim Rejections - 35 USC § 102 and 103***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-2, 4-7 and 16-20 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Wu et al. (US 2005/0040392 A1).

**Regarding claim 1**, Wu et al. teaches (Figure 6A -6D) light-emitting device(2), comprising at least a substrate (Paragraph 53, lines 1-5), an anode (10), a first hole transport layer (635), a light-emitting layer (639) and a cathode (14), wherein a first hole blocking layer (637) is arranged between the first hole transport layer (635) and the light-emitting layer (639); wherein, when the light-emitting layer is in operation to emit light, a first hole blocking layer (637) is arranged between the first hole transport layer (635) and the light-emitting layer (639). *(Examiner note prior art teaches that the layer 637 is a hole blocking layer until a certain threshold is reached for it to change display characteristics, applicant has not stated that the hole blocking layer could only function as a hole blocking layer, thus rejection remains):*

**Regarding claim 2**, Wu et al. teaches wherein a second hole blocking layer (613) is arranged between the cathode (14) and the light-emitting layer (611).

**Regarding claim 4**, Wu et al. teaches (Figure 6c) that the further hole blocking layers (633,637) and hole transport layers (631,635) are arranged in an alternating manner.

**Regarding claim 5**, Wu et al. teaches wherein the oxidation potential of the material of a hole blocking layer (135) is higher than the oxidation potential of an adjoining hole transport layer (131, TATE). *(Examiner note the material disclosed by prior art is BCP which is a material that the applicant also uses as well as the TATE, as such examiner takes the position that this requirement is therefore satisfied)*

**Regarding claim 6**, Wu et al. teaches wherein the material of a hole blocking layer is selected from the group consisting of 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (Bathocuproin, BCP), 3-(4-biphenyl)-4-phenyl-5-tert-butylphenyl-1,2,4-triazole (TAZ), 2-(4-biphenyl)-5-(p-tert-butylphenyl)-1,3,4-oxadiazole (tBu-PBD), 2-(4-biphenyl)-5-(4-tert-butylphenyl)-1,2,4-oxadiazole (PBD), 1,3,5-tris-(1-phenyl-1H-benzimidazol-2-yl)benzene (TBPI) and oligophenyls with perfluorinated side chains (Figure 7, BCP). *(Examiner note the material disclosed by prior art is BCP which is a material that the applicant also uses as well as the TATE, as such examiner takes the position that this requirement is therefore satisfied)*

**Regarding claim 7**, Wu et al. teaches (Figure 6a) wherein an electron transport layer (619) is arranged between cathode (14) and light-emitting layer (615).

**Regarding claim 16**, *this claim is drawn to a method of operating and does not provide any particular structural limitations; therefore this claim is not considered germane to the applicant's invention as currently claimed*), Wu teaches all the structural limitations have

been met and arranged in the order claims as such, thus the examiner takes the position that this functional limitation has been satisfied.

**Regarding claim 17**, Wu teaches claim 1 and 2 Wu does not specifically teach another hole transport layer and at least one further hole blocking layer arranged between the first hole transport layer and the anode. However, Wu teaches a plurality of HTL and HBL layers in order to provide a device which is efficient and has improved voltage characteristics by arranging these layers in alternating fashion. Therefore it would be obvious for one of ordinary skill at the time of the invention to include one further hole transporting and hole blocking layer to improve the efficiency and lower the operating voltage as taught by Wu et al.

**Regarding claim 18**, Wu teaches a light-emitting device (Figure 6a) comprising: an anode (10), a cathode (14), and at least one light emitting layer (615,eml2) arranged between the anode (10) and cathode (14), wherein each light emitting layer includes at least one hole transport layer (611) and at least one hole blocking layer (613) arranged between the anode ( 10) and the light emitting layer (615).

**Regarding claim 19**, Wu teaches (Figure 6a )including at least one further hole blocking layer (617) arranged between the at least one light emitting layer (615) and the cathode (14).

**Regarding claim 20**, Wu teaches all the structural limitations have been met and arranged in the order claims as such, the examiner takes the position that this functional limitation has been satisfied, *wherein each hole blocking layer is arranged to permit a*

*number of holes to flow into the at least one light emitting layer that is approximately equivalent to a number of electrons flowing into the at least one light emitting layer.*

**Claim Rejections - 35 USC § 103**

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2003/0068528 A1).

**Regarding claims 10-11**, Thompson teaches the materials as disclosed in the applicant's specification (Page 4, lines 1-6 and 20-24, Page 5, lines 20-25). Thompson discloses Irppy (light-emitting material) (Paragraph 88), BCP(HBL material) (Paragraph 90) and PDOT (HTL) (Paragraph 90). Thompson further teaches the relationships of the HOMO and LUMO characteristics (Paragraphs 80 and 81 and 88, 90) of the these three layers along with the relationship of between these different layers in order to provide a device that is stable towards oxidation, has increased life span and improved overall efficiency (Paragraph 11, lines 1-6 and Paragraph 12).

Therefore one of ordinary skill in the art at the time of the invention could modify the light emitting device of Thompson wherein a first distance between the highest occupied molecular orbital (HOMO) and the lowest occupied molecular orbital (LUMO) of the hole blocking layer is greater than a second distance between the HOMO and the



LUMO of the electroluminescent layer and a third distance between the HOMO and the LUMO of the hole transport layer is greater than the second distance between the HOMO and the LUMO of the electroluminescent layer in order to provide a device that is stable towards oxidation, has increased life span and improved overall efficiency as taught by Thompson.

**Regarding claim 12**, Thompson teaches wherein the hole transport layer comprises a material having a low ionization potential with a low electron affinity (Paragraph 76) *(Examiner note the material disclosed by prior art in cited paragraph is a material that the applicant also discusses in pages 4-5 of the specification, as such examiner believes this requirement is therefore satisfied)*

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2003/0068528 A1) in view of Forrest et al. (US 6,451,415 B1)

Thompson teaches the light -emitting device set forth above (see rejection claim 8). Thompson is silent regarding at least one second hole transport layer and at least one second hole blocking layer, located between the hole blocking layer and the electroluminescent layer, wherein the at least one second hole transport layer and the at least one second hole blocking layer are arranged in an alternating manner.

In the same field of endeavor of light-emitting devices, Forrest et al. teaches (Figure 2D) wherein plurality of hole transport layers (2D02) and a plurality of hole blocking layers (2D03) are arranged in an alternating manner in order to provide a device with improved internal and external quantum efficiencies (Column 6, lines 64-67).

Therefore one of ordinary skill in the art at the time of the invention could modify the light emitting device of Thompson at least one second hole transport layer and at least one second hole blocking layer, located between the hole blocking layer and the electroluminescent layer, wherein the at least one second hole transport layer and the at least one second hole blocking layer are arranged in an alternating manner in order to provide a device with improved internal and external quantum efficiencies as taught by Forrest et al.

11. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (US 2005/0040392 A1). in view of Forrest et al. (US 6,451,415 B1)

Wu teaches the light -emitting device set forth above (see rejection claim 1 and 18). Wu is silent regarding a plurality of pairs of hole transport layer and hole blocking layer arranged between the anode and the at least one light emitting layer.

In the same field of endeavor of light-emitting devices, Forrest et al. teaches (Figure 2D) wherein a plurality of hole transport layers (2D02) and a plurality of hole blocking layers (2D03). Forrest et al. does not explicitly teach a plurality of pairs of hole transport layer and hole blocking layer arranged between the anode and the at least one light emitting layer. He rather teaches a plurality of htl and hbl layers arranged are arranged in an alternating manner in order to provide a device with improved internal and external quantum efficiencies (Column 6, lines 64-67).

Therefore one of ordinary skill in the art at the time of the invention could modify the light emitting device of Wu wherein a plurality of pairs of hole transport layer and hole blocking layer arranged between the anode and the at least one light emitting layer

in order to provide a device with improved internal and external quantum efficiencies as taught by Forrest et al.

***Response to Arguments***

1. Applicant's arguments with respect to claims 17-21 have been considered but are moot in view of the new ground(s) of rejection.
2. Applicant's arguments filed 01/26/2009 have been fully considered but they are not persuasive. The applicant alleges that the examiner has neither rejected claims 10-13 nor 15-16. Claims 10-13 were rejected in the previous office action and are repeated here again in this rejection. Since applicant has not addressed the rejection, no further comments are necessary regarding these claims. Claims 15-16 were drawn to a mode of operation, as stated in the previous rejection and again in this one. The applicant claimed as device not a mode of operating the device. These claims rendered no structural limitations, thus, as examiner stated previously were not considered germane to the device. Again as applicant has not addressed this, examiner assumes applicant is agreement.

Applicant first alleges Thompson teaches a conventional OLED and that he teaches an EBL layer which the applicant has interpreted as an electron blocking layer. With this interpretation, the applicant asserts that the limitations with the Thompson reference has not been met or unfounded and thus must be withdrawn.

The examiner respectfully disagrees applicant has cited EBL to be an electron blocking layer, the EBL of the rejection is an exciton blocking layer. The paragraphs

cited by the examiner clearly show that the exciton layer can function as a HBL layer or EBL layer, depends upon the need and the desire of operability of the device. The applicant cited paragraph 82, but that merely states that the exciton blocking layer can block electrons, examiner does not disagree, but as stated above Thompson teaches the exciton layer can serve as both exciton and hbl or electron blocking layer thus the rejection remains.

Wu teaches a reconfigurable OLED and applicant argues that the limitation "when the device emits light" the hole blocking layer no longer exist. Secondly the oled has to reach a temperature higher than the glass transition of the layer before it would no longer be a hole blocking., and lastly nowhere in claim language is there an assertion that the layer is only a hole blocking layer and nothing else, thus during some period of operation and when fabricates has a hbl as defined by current claim. No other rejections being addressed, rejections remain the same.

### ***Conclusion***

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRACIE Y. GREEN whose telephone number is (571)270-3104. The examiner can normally be reached on Monday-Thursday, 7:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571/272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

/Tracie Y Green/  
Examiner, Art Unit 2879

/Sikha Roy/  
Primary Examiner, Art Unit 2879

